

Critical and creative thinking: How can it be fostered and developed at the tertiary level?

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Educators, researchers, and the business community have long lamented that students are not learning the high level thinking and problem solving skills needed to confront our rapidly changing world and the problems facing society as a whole (Nickerson, 1994). This is despite attempts at all levels of education to deal with the sometimes elusive concepts of "critical" and "creative" thinking. So what is the answer? Should students attend special units or courses in critical and creative thinking? Can thinking skills be developed through the curriculum when there is so much content to teach? What are the implications of such approaches?

These dilemmas will be addressed in this session through exploring with participants the various meanings we attach to the terms "critical" and "creative" thinking, the relationship between critical & creative thinking and knowledge acquisition, and the implications for how such thinking can be fostered and developed at the tertiary level so that we better meet the concerns of the community.

Introduction

The last 30 years has seen a proliferation of books, articles, courses and teaching materials on "critical" and "creative" thinking aimed at students at all levels of education: primary, secondary and tertiary. Yet, educators, researchers and the business community are still concerned that students are not learning the high level thinking and problem solving skills needed to confront our rapidly changing world and the problems facing society as a whole (Nickerson, 1994). How can this concern be resolved at the tertiary level? This paper aims to examine this dilemma through first considering what "critical" and "creative" thinking means in terms of the skills, processes and personal attributes these terms encompass and secondly by addressing the implications of these observations for tertiary educators.

What is "critical" and "creative" thinking?

At its most basic, writers from across the literature appear to agree that critical thinking involves the evaluation of information and that creative thinking involves the generation of ideas (Marzano et al 1987; Nickerson, 1990). Scriven and Paul (1996) further expand on the definition of critical thinking to encompass, not only the evaluation of information, but also its conceptualisation, application,

analysis and synthesis. They point out that this information may be derived from observation, experience, reflection, reasoning or communication. Creative thinking, on the other hand, can be thought of as the generation of such information and, at its most creative, results in ideas that Ruggiero (1988) describes as "original, imaginative and uncommon". These complementary types of thinking co-occur to varying degrees in a wide range of thinking tasks and are often difficult to separate. Hence, in developing students' thinking skills, both need fostering. However, a perusal through the literature shows that clear guidelines for developing both these types of thinking are not readily available for teaching practitioners to follow and apply. Different writers tend to focus on different aspects of thinking (eg critical, creative, problem solving, decision making) and in so doing, use a wide array of terminology in different ways including terms such as: skills, strategies, processes, dispositions, habits and abilities. How can these various perspectives be reconciled?

A framework

One way of dealing with these various perspectives is by finding the connections between them. According to Ruggiero (1988), the fostering of thinking needs to be holistic, covering both the critical and the creative. In this way both the production and evaluation of ideas can be developed. Within such an holistic framework, a connection can be made between dispositions, skills and processes. The strategies teachers can use, alongside the strategies and steps students can take to develop these skills and processes, can then be examined.

At the heart of developing thinking lies the dispositions. Dispositions (sometimes termed "habits" or "abilities") reflect the attitudes and beliefs that are brought to the thinking task. According to writers such as Ruggiero (1988) and Oxman-Michelli (1992), certain dispositions, also referred to as a "critical spirit", facilitate and make the thinking process effective. Table 1 provides examples of different types of dispositions considered essential to effective thinking.

Table 1: Examples of dispositions considered necessary for critical and creative thinking

<i>From Ruggiero (1988)</i> Interest in sources of attitudes, beliefs and values Eagerness to develop mental processes Willingness to make mistakes Positive attitude toward novelty Interest in widening experience Passion for truth	<i>From Oxman-Michelli (1992)</i> Self-confidence and intellectual autonomy Curiosity and attentiveness Enthusiasm and perseverance Objectivity, integrity and humility Fairmindedness, readiness to listen and consider others' points of view
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Bloom and Broder as cited by Ruggiero (1988) found that students who had negative attitudes, who lacked faith in their abilities and who let personal opinion interfere with their objectivity, were poor problem solvers. Clearly, the attitudes brought to thinking tasks affect how well the tasks are tackled and completed.

These dispositions or attitudes are not merely the domain of the student: they can be shaped by the teacher and the classroom atmosphere. Oxman-Michelli (1992) suggests a number of strategies for

teachers for the development of such dispositions in their students. These include:

- demonstrating such a "critical spirit" themselves
- engaging students in thinking tasks which elicit these dispositions
- rewarding students for demonstrating "critical spirit".

Adopting such strategies implies that students will not be penalised for questioning, taking risking and failing. It also implies possible changes in assessment, class tasks and the relationship between staff and students. The adoption of such strategies, in conjunction with a learning environment that is exciting, full of new experiences and challenges, will allow the skills and processes needed for effective critical and creative thinking to develop.

A wide range of skills in both areas of critical and creative thinking have been identified through the literature. Examples have been collated in Table 2.

Table 2: Examples of skills used in critical and creative thinking

Critical thinking	Creative thinking
<p><i>From Ennis (1987)</i></p> <p>Focussing on a question</p> <p>Analysing arguments</p> <p>Judging the credibility of a source</p> <p>Observing and judging observation reports</p> <p>Deducing and judging deductions</p> <p>Inducing and judging inductions</p> <p>Making value judgements</p> <p>Defining and judging definitions</p> <p>Identifying assumptions</p> <p><i>From Marzano et al (1988)</i></p> <p>Comparing</p> <p>Classifying</p> <p>Ordering</p> <p>Representing</p> <p>Summarising</p> <p>Restructuring</p> <p>Predicting</p> <p>Elaborating</p> <p>Identifying attributes, relationships, main ideas, errors</p>	<p><i>From Lubart (1994)</i></p> <p>Problem finding</p> <p>Problem definition</p> <p>Problem representation</p> <p>Strategy selection</p> <p>Noticing relevant new information</p> <p>Comparing disparate information</p> <p>Finding relevant connections and combining information</p> <p>Generating multiple ideas</p> <p><i>From Ruggiero (1988)</i></p> <p>Deferring judgement</p> <p>Shifting perspective</p> <p>Generating imaginative ideas</p> <p><i>From De Bono (1978)</i></p> <p>Generating new ideas</p> <p>Challenging assumptions</p> <p>Generating alternatives</p>

Examination of Table 2 shows the difficulties that can arise when attempting to separate these two "types" of thinking. Under the headings of both "critical" and "creative" thinking are listed similar skills. For instance "restructuring" appears similar in nature to "finding relevant connections and combining information". At other times, the two skill lists highlight differences in when to apply

seemingly contradictory skills such as "judging" on the one hand, and "deferring judgement" on the other. Yet, there are still distinctive skills in each thinking area. So while there is cross-over, there are also differences and these are reflected in the strategies both teachers and students can take.

For students to learn a full range of skills, teachers need to adopt teaching techniques and strategies that promote both critical and creative thought. Table 3 outlines examples of strategies from the literature that teachers can use to develop these two types of thinking.

Table 3: Examples of teaching strategies which develop critical and creative thinking skills

Strategies to develop critical thinking	Strategies to develop creative thinking
<p><i>From Ruggiero (1988)</i></p> <p>Frequently pose issues to be explored</p> <p>Play devil's advocate to raise awareness of the neglected side of an argument</p> <p>Present common fallacies in the field and have students analyse them</p> <p>Present current affairs as thinking exercises</p> <p>Build thinking exercises into reading assignments</p> <p>Build a journal requirement into the course</p> <p>Have students debate important issues</p> <p>Have students develop questions</p> <p><i>From Paul (1992)</i></p> <p>Use socratic questioning to elicit and probe students' thoughts in class discussion. Questions can be asked:</p> <ul style="list-style-type: none"> for students to clarify to probe assumptions to probe reasons and evidence to probe viewpoints or perspectives to probe implications and consequences to question the questions 	<p><i>From Ruggiero (1988)</i></p> <p>Frequently pose problems to be solved</p> <p>Encourage students to "think aloud" when they have difficulty solving problems</p> <p>Involve students in the search for interesting problems for class discussion</p> <p>Have students design assignments for the following semester</p> <p>Build-on to argument analysis questions that require creative thought</p> <p>Set exercises that encourage students to</p> <ul style="list-style-type: none"> notice unmet needs and need for improvement improve or invent new systems, processes, concepts etc <p><i>From De Bono (1978)</i></p> <p>Provide a range of problem types:</p> <ul style="list-style-type: none"> Open-ended problems - both immediate and from the general world Design and innovation problems Closed problems

Examination of table 3 shows that many of these teaching strategies provide students with the opportunities to develop and practise the types of skills listed in table 2 as well as support the development of the dispositions listed in table 1. The table also shows that by focussing on both critical and creative thinking, a wide range of teaching strategies needs to be employed in order to provide students with the opportunities to develop skills in both areas.

Providing students with multiple and varied opportunities to engage with material in critical and creative ways under the guidance and support of the teacher, certainly provides fertile ground in

which students can develop a wide range of skills. Students, however, can also benefit from exposure to the various strategies they could employ to help themselves successfully deal with challenging thinking tasks they are being set. Table 4 outlines a number of strategies derived from the literature that students could use to improve their critical and creative thinking abilities.

Table 4: Examples of strategies students could use to improve their critical and creative thinking abilities

Strategies to improve critical thinking	Strategies to improve creative thinking
<p><i>From: Chaffee (1997)</i> Ask yourself key questions. Eg:</p> <ul style="list-style-type: none"> What is the issue? What is the evidence? What are the arguments? Are the evidence and arguments sound? <p>Check the argument for</p> <ul style="list-style-type: none"> fallacies empirical generalisations false generalisations <p>Identify the words that cue in an argument Use mind maps to clarify your conceptualisation</p>	<p><i>From: Chaffee (1997)</i> Ask yourself key questions. Eg:</p> <ul style="list-style-type: none"> What is the problem? What are the alternatives? What are the advantages and disadvantages of each alternative? <p>Create mind maps Brainstorm ideas Absorb yourself in the task Allow time for ideas to incubate Seize on ideas when they emerge and follow them through Beware of the voice of judgement Create positive voices and visualisations</p> <p><i>From De Bono (1978)</i> Use analogies Generate multiple alternatives Challenge assumptions: Keep asking "why" Break down patterns and restructure them Look at the situation in reverse</p>

Examination of Table 4 shows that, similar to the skills lists, while there is some cross-over between the strategies that students can use in developing their critical and creative thinking abilities, there are also strategies unique to each type, once again emphasising the need to vary opportunities to develop a wide range of skills in students.

How do the skills and strategies relate to processes? Marzano et al (1988) define processes as involving a complex set of skills used to achieve an end goal. Many of the major assignment tasks set at the tertiary level would fit such a definition - whether they require, for instance, critical review of the literature, development of a system, evaluation of a real world situation or any combination or permutation of such tasks. These involve many skills which require relevant strategies for their successful execution. And, because of their complexity, such processes themselves require strategies to deal with the complex relationships required in using the relevant skills. These strategies might include the use of specific steps, the decomposition of the task into sub-goals or the application of

learning gleaned through the tackling of another similar task (Nickerson, 1994).

Implications

So how can such skills, strategies and processes be developed at a tertiary level? One way would be to explicitly teach students specific skills along with the strategies they could employ. Such courses exist at most universities in the form of units on "critical thinking". These tend, however, to deal mainly with argument analysis, thus not addressing the full complement of skills required for both critical and creative thought. Both types of thinking are needed to address community concerns about the skills needed by graduates. This could indicate a need for other courses to be developed to address these skills or for existing courses to incorporate a wider range of skills in their teaching.

But is it enough to teach thinking skills separately from content? Applying critical and creative approaches to content allows students to deeply engage with the knowledge they are learning. This ability to deeply engage with knowledge results in deeper understanding (Biggs & Moore, 1993; Paul, 1992), which would need to be the aim of any tertiary course.

Unfortunately, an assumption that could be made by teaching such skills separately, is that they can be developed separately from content. Research has shown, however, that as knowledge is better understood so the ability to solve problems, apply knowledge, develop one's own arguments and find problems within the domain improves (Ericsson & Hastie, 1994; Bransford et al, 1990).

Hence, there would appear to be an interdependent, cyclical, self-improving relationship between critical and creative thinking and depth of knowledge. As one engages with material through critical and creative approaches so depth of knowledge increases and as depth of knowledge increases so the ability to evaluate and generate ideas improves. This is why both critical and creative thinking need to be incorporated across the curriculum.

Conclusion

Both critical and creative thinking are needed to deal with the issues and problems facing the world today. In addition to any support units which teach specific skills and strategies explicitly, teaching approaches which adopt strategies that support critical and creative engagement with knowledge need to be incorporated. These act not to replace content material, but rather as a vehicle for increasing students' depth of knowledge. This paper argues that by setting students challenging tasks which embrace both types of thinking within an environment that supports a "critical spirit", then not only will a wide range of skills, processes and strategies be developed, but appreciation of the content will be improved.

References

Biggs, J.B. & Moore, P.J. (1993). *The process of learning*. New York: Prentice Hall

Bransford, J.D. & Stein, B.S. (1993). *The IDEAL problem solver*. (2nd ed) New York: W.H. Freeman and Company.

Bransford, J.D.; Vye, N.; Kinzer, C.; Risko, V. (1990). Teaching thinking and content knowledge. In: B.F. Jones L. Idol (Eds), *Dimensions of thinking and cognitive instruction*. Hillsdale: Lawrence Erlbaum Associates, Publishers.

Chaffee, J. (1997). *Thinking critically*. (5th ed) Boston: Houghton Mifflin Company.

De Bono, E. (1978). *Teaching thinking*. Middlesex, Penguin Books Ltd.

Ennis, R.H. (1987). A taxonomy of critical thinking dispositions and abilities. In: J.B. Baron & R.J. Sternberg (Eds), *Teaching thinking skills: Theory and practice*. New York: W. H. Freeman and Company.

Ericsson, K.A. & Hastie, R. (1994). Contemporary approaches to the study of thinking and problem solving. In: R.J. Sternberg (Ed), *Thinking and problem solving*. (2nd ed) San Diego: Academic Press.

Lubart, Y. (1994). Creativity. In: R.J. Sternberg (Ed), *Thinking and problem solving*. San Diego: Academic Press.

Marzano, R.J.; Brandt, R.S.; Hughes, C.S.; Jones, B.F.; Presseisen, B.Z.; Rankin, R.C.; Suhor, C. (1988). *Dimensions of thinking: a framework for curriculum and instruction*. Alexandria: The Association for Supervision and Curriculum Development.

Nickerson, R.S.(1990). Dimensions of thinking: a critique. In: B.F. Jones L. Idol (Eds), *Dimensions of thinking and cognitive instruction*. Hillsdale: Lawrence Erlbaum Associates, Publishers.

Nickerson, R.S. (1994). The teaching of thinking and problem solving. In R.J. Sternberg (Ed), *Thinking and problem solving*. (2nd ed) San Diego: Academic Press.

Oxman-Michelli (1992). *Critical thinking as "critical spirit"*. Resource Publication Series 4 No. 7. Montclair: Montclair State College. Institute for Critical Thinking . ED 357 006

Paul, R. (1992). *Critical thinking: What every person needs to survive in a rapidly changing world*. (Revised 2nd ed) Santa Rosa: The Foundation for Critical Thinking.

Ruggiero, V.R. (1988). *Teaching thinking across the curriculum*. New York: Harper & Row Publishers.

Scriven, M. & Paul, R. (1996). *Defining Critical Thinking*. <http://www.sonoma.edu/CThink/University/univclass/Defining.nclink> [24 Jan 1999]

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